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(1870), of the genus *Lespedeza* (1873), of the *Spiræaceæ* (1879), and of *Coriaria*, *Ilex*, etc. (1881); also a series of twenty papers entitled *Diagnoses Plantarum Novarum Japoniæ et Mandshuriæ* (1866–1876), and another series entitled *Diagnoses Plantarum Novarum Asiaticarum* (1877–1890). In 1873 he visited Finland and Sweden, especially to consult the herbarium of Thunberg at Upsal, and most of the summer of 1875 was spent in a visit to Scotland, Kew, Paris, and Germany. At about this time he was also expending much critical labor upon Japanese plants in aid of Franchet and Savatier in the preparation of their *Enumeratio Plantarum Japonicarum*, which owes its value very largely to this co-operation.

The last ten years of his life were occupied chiefly in the study of large and important collections from the previously almost inaccessible regions of Central Asia, especially those of Przewalski and Potanin from Tangout (Northern Tibet) and Mongolia, and in the elaboration of an extended report which was to be illustrated with a hundred or more finely engraved plates. Much of this was completed and ready for the press, but only the first parts are as yet published. The general results, as showing the characteristics of the flora of the region, were ably summarized by him in a paper read before the Botanical and Horticultural Congress held at St. Petersburg in 1884. To the great loss of botanical science he was cut off most unexpectedly in the midst of his labors, dying on February 16, 1891, of an attack of influenza, after a short illness.

The work of Maximowicz, as a botanist, is remarkable throughout for its extreme thoroughness and most scrupulous exactness in all its details, for good judgment and a purely scientific spirit, and he must always rank as a high authority in the department to which he devoted himself. As a man he was most estimable, of noble and spotless character, a scholar of high culture, and a most courteous and genial correspondent.

KARL WILHELM VON NAEGELI.

KARL WILHELM VON NAEGELI was born on March 27, 1817, at Kilchberg, near Zurich, and died at Munich, May 10, 1891. His education, begun in a private school at Zurich, was continued in the Gymnasium of that city until he entered the University of Zurich, where he received his doctor's degree in 1840. He had at first intended to study medicine, but his taste for natural science

was so decided that he was allowed to go to Geneva, where he studied with De Candolle for a time. He afterwards went to Berlin, where his attention was turned to philosophical studies. He then proceeded to Jena, where he was associated with Schleiden, whose influence is clearly seen in the earlier writings of Naegeli. He was married in 1845, and soon after returned to Zurich, where he became Privatdocent, and afterwards Professor Extraordinarius. In 1852, Naegeli, after having declined a call to Giessen, was appointed Professor at Freiburg, in Breisgau. In 1855 he again returned to Zurich, where he was made Professor of General Botany in the new Polytechnic School. He resigned this position in 1857, and accepted an appointment as Professor of Botany and Director of the Botanic Garden at Munich, where he remained until his death. For the last twenty years of his life Naegeli's health was feeble, but he was nevertheless able to continue his scientific work during most of that period. In his feeble condition he was unable to rally from an attack of the influenza during the epidemic of 1889-90, and gradually succumbed to the disease.

During his long and active scientific career, Naegeli's influence was seen mainly in his writings, for, as a university lecturer, he did not succeed to the same extent as some of his contemporaries in attracting numbers of enthusiastic followers. Owing to certain peculiarities of temperament he was not personally popular with the botanists of Germany, and few of the younger botanists sought his instruction. That he was, however, capable of stimulating others to work of the highest grade is evident, if we consider that C. Cramer and Schwendener were his pupils and associates.

As a writer and investigator probably no botanist of the present century has had greater influence in shaping the course of modern botany than Naegeli. His botanical career began at a time when the influence of Schleiden was predominant, and naturally the early work of Naegeli bore the mark of Schleiden's peculiar views. But Naegeli was a man of decided originality, and united great accuracy as an observer with a genius for speculation and philosophical inquiry, and he soon freed himself from the limitations of Schleidenian conceptions. If, at the present day, we are obliged to admit that some of Naegeli's own theories have not stood the test of time, we must also admit that they were very suggestive and fruitful of results in their day, while, as an observer of facts, we can only admire his uniform accuracy and truthfulness. It is only natural that the theoretical views of Naegeli, formulated at a

time when botanists were comparatively few and accurate observations scanty, should, in the light of accumulated modern observations, be superseded by other more tenable theories; but we must still continue to acknowledge that we are indebted to Naegeli for the solid foundation of more than one of the branches of botany which are now regarded as among the most interesting and important fields of modern research.

Naegeli was neither a pure systematist, nor strictly a physiologist in the modern sense. If he pursued systematic studies to some extent, it was with the view of preparing himself to discuss the abstract questions of the nature of species and the theory of descent. His detailed work on the genera *Cirsium* and *Hieracium* was undertaken with very much the same purpose as that of Darwin in his work on *Cirrhypeds*; namely, by mastering the specific differences to be found in a few large and variable genera, to prepare himself for the intelligent discussion of the relations and probable origin of species in general. Beyond this he felt little interest in systematic work. So far as his work on the nature of cell structure, the formation of the cell wall, the method of reproduction in Cryptogams, and the phenomena of fermentation is concerned, it was certainly physiological rather than systematic; but, using the terminology of the present day, it may be said that Naegeli was pre-eminently an histologist, and that the greater part of his theories and general views, so far as they were derived from his own work, had a histological basis. Unlike De Bary, Pringsheim, and the younger generation of German botanists, he did not attempt, to any extent, to study what may be called the life-history of any special group by means of cultures.

The histological work of Naegeli was admirable, and he was practically the first to introduce histological methods into the study of algæ and other groups. In his "Die neueren Algensysteme und Versuch zur Begründung eines eigenen Systems der Algen und Florideen" (1847) he accumulated a large mass of facts, and was the first to give an accurate account of the thallus of different species, and to show the necessity for studying the apical growth as a means of classification in this group. In his attempt to form a new system of classification he was less successful. He excluded the *Florideæ* from algæ; but although he was accurate as far as concerned the microscopic structure which he studied, he failed to recognize the true sexual relations of the *Florideæ*. In his paper "Beiträge zur Morphologie und Systematik der Ceramiaceæ"

(1861) his accuracy as an observer is shown, for in this paper he first figured correctly the young female condition of the *Florideæ*, but again failed to comprehend the true significance of his observation, and it was left to Bornet and Thuret, in 1867, to give the proper explanation and fix the true position of the *Florideæ*. It may be said that had Naegeli studied living instead of alcoholic material, he might perhaps have avoided his error. Naegeli's paper on the cell division in *Delesseria Hypoglossum* and on the structure of *Caulerpa prolifera* were also valuable contributions to our knowledge of algæ, and his "Gattungen einzelliger Algen" (1849), more purely systematic than his other works on algæ, still remains a classic monograph on the subject.

In his first histological paper (1841) on the development of pollen, and in later papers on the development of stomata and the structure of the root-apex, Naegeli proved himself to be a better observer than his teacher, Schleiden, and in two important papers published in 1844 and 1846 on nuclei and the formation and growth of vegetable cells, he showed emphatically that cell division is the true mode of vegetative cell formation. Although in his earlier paper on the growth of the leaf, Naegeli had been led to erroneous views on the nature of stems and leaves, nothing but praise can be said of his paper on the "Growth of the Stem and Root in Vascular Plants and the Arrangement of the Vascular Bundles" (1858). This paper is regarded by botanists as his most important histological work, and is the basis of the countless works of more recent writers on the subject. The enormous work of over six hundred pages on starch grains (1858) is full of important observations, and served as the foundation of the micellar theory, which has been alternately attacked and defended up to the present time, one phase of the discussion being the method of formation of cell walls by intussusception as opposed to apposition. For some time the preponderance of opinion rather favored Naegeli's theory of intussusception, but, although the question cannot as yet be said to be settled fully, the advocates of the theory of apposition have of late appeared to have the strongest evidence on their side, and physicists, as a rule, do not regard the micellar theory with much favor.

Naegeli's writings on fermentation, "Theorie der Gährung" (1879), with which may be classed properly his "Die niederen Pilze" (1877), represent rather his theoretical views based on the work of others than conclusions founded on his own work.

Although interesting and suggestive, they hardly possess the same weight as his other writings. He differs with many recent writers in believing that, among forms like bacteria, it is doubtful whether definite species exist, morphologically speaking, as in higher plants. It is still too soon to say whether his view on this point is correct or not; for, although most bacteriologists do not now agree with Naegeli, it must be admitted that the question is still an open one, and it would be rash to predict what would be the general verdict on this point a decade hence.

Up to this point we have spoken only of the special work which entitles Naegeli to be regarded as one of the foremost botanists of his time, unsurpassed and perhaps unequalled in his own special field. But his influence was felt beyond purely botanical circles, and he acquired by his writings on evolution a wide-spread reputation among all scientific men. In his doctor's thesis (1840) on the Swiss species of *Cirsium*, Naegeli foreshadowed a line of study which he afterwards worked out more elaborately in his later work on *Hieracium*, in which he made a minute and critical study of the variable species of a large genus serve as a groundwork for a consideration of the theory of descent. Early in life he believed in the absolute difference of species, although he urged the necessity of the study of development as that which gives real value to the knowledge of mature forms. In a later work, however, he stated that this early belief in the absolute difference of species "did not prevent his believing even then in the origin of species by descent." In his important paper, "Die Entstehung und Begriff der naturhistorischen Art" (1865), he discussed the Darwinian view of the origin of species, and stated that his own belief in the origin of species by descent had been definitely expressed in a paper published in 1856. He differed with Darwin in believing that variation occurred in a definite direction, — a view similar to that held by Gray, — and he was unable to accept natural selection as a sufficient explanation of evolution. His views were peculiar in that he believed that the different groups of plants originated independently from what he called "Urzellen," and, taking the different groups as they now exist, he failed to recognize a gradual development of the higher forms from the lower. Without stopping to consider his papers on the influence of external conditions in the formation of varieties and the theory of hybrid formation, we need here only refer to "Die mechanisch-physiologische Theorie der Abstammungslehre" (1884), a work in which he states the

conclusions reached as the result of an unusually long and profound study. This work must be regarded as Naegeli's greatest contribution to speculative science, worthy to be classed with the masterpieces of the great writers on evolution. He maintains that variation arises from internal, not external causes, and that the transmission of hereditary characters depends not on the general protoplasm, but on a limited and definite part of it, the idioplasm. The enunciation of the general principle in the *Abstammungslehre* is forcibly and even brilliantly stated, and Naegeli's presentation of the subject has exerted and will continue to exert a marked influence on modern thought, although in some details he allows himself to indulge in views which are too purely speculative, and not borne out by the more exact microscopic work of a younger generation of workers.*

EDUARD SCHÖNFELD.

EDUARD SCHÖNFELD was born on December 22, 1828, at Hildburghausen, Germany. The comprehensive activity of his mind was early displayed in the course of his education, for he studied architecture and chemistry before finally selecting astronomy as his special field of work. His astronomical studies were begun at the University of Marburg, and continued, in 1852 and later, at Bonn, under the guidance of the illustrious Argelander. He took his degree in 1854, but had already in the previous year been appointed Assistant in the Observatory.

At this time, Argelander was entering upon the execution of his plan for the formation of a catalogue which should exhibit the approximate positions, and also the magnitudes, of all stars in the northern hemisphere not fainter than the ninth magnitude. He had made some preliminary observations for this purpose in 1852, but the work was definitely begun only after he had been joined by Schönfeld, who took a prominent part both in the observations themselves and in their reduction. The catalogue itself, which comprises 324,198 stars, was mainly drawn up by him.

In 1859, Schönfeld was appointed Director of the Observatory at Mannheim. Here he undertook the systematic observation of variable stars, and his two successive catalogues of these objects

* A detailed account of Naegeli's life and work is to be found in the "*Neue Zürcher Zeitung*" for May 16, 1891, and in "*Nature*" for October 15, 1891.